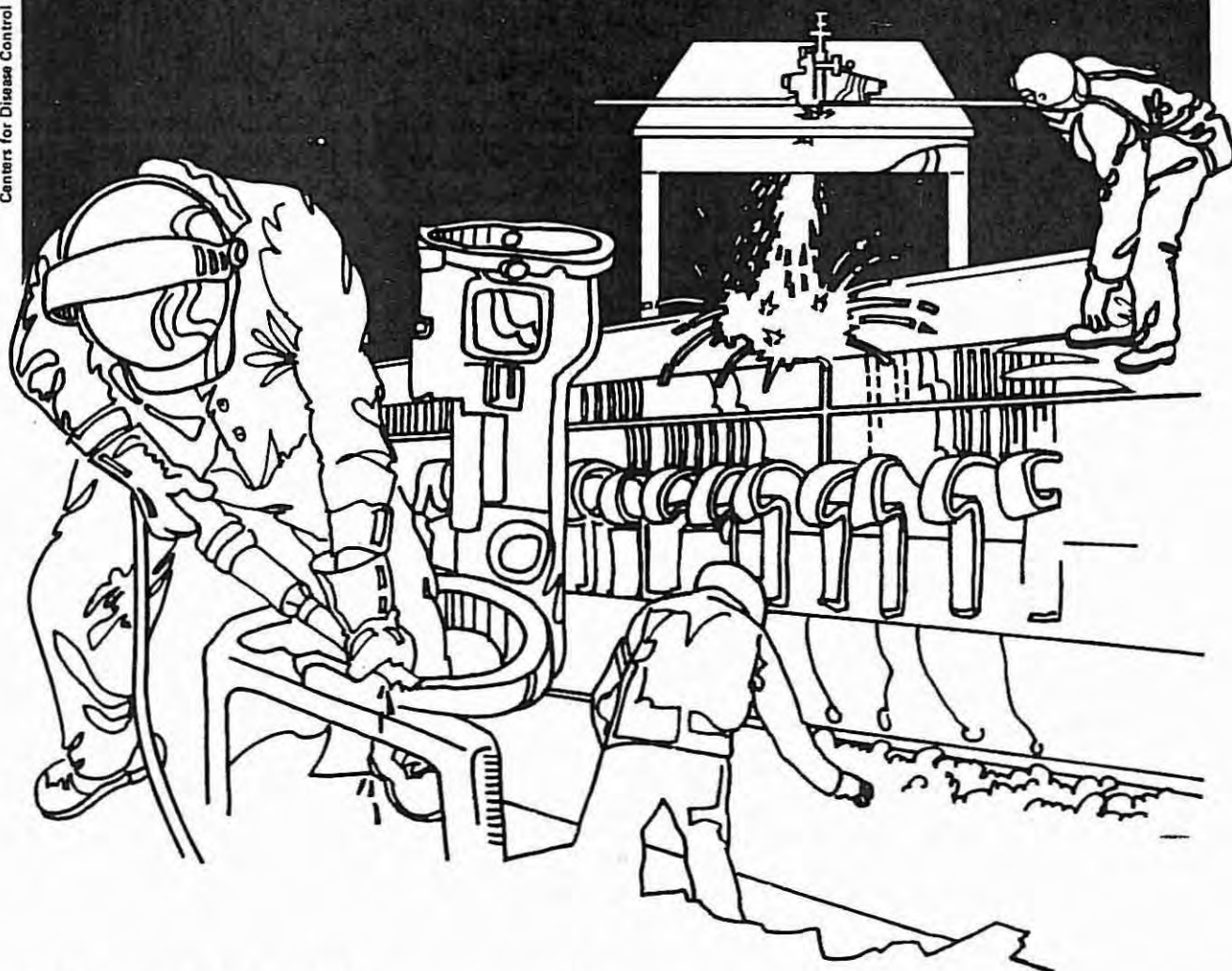


# NIOSH



## Health Hazard Evaluation Report

HETA 83-114-1304  
PLAN DE SALUD DEL VALLE, INC.  
FORT LUPTON, COLORADO

## PREFACE

The Hazard Evaluations and Technical Assistance Branch of NIOSH conducts field investigations of possible health hazards in the workplace. These investigations are conducted under the authority of Section 20(a)(6) of the Occupational Safety and Health Act of 1970, 29 U.S.C. 669(a)(6) which authorizes the Secretary of Health and Human Services, following a written request from any employer or authorized representative of employees, to determine whether any substance normally found in the place of employment has potentially toxic effects in such concentrations as used or found.

The Hazard Evaluations and Technical Assistance Branch also provides, upon request, medical, nursing, and industrial hygiene technical and consultative assistance (TA) to Federal, state, and local agencies; labor; industry and other groups or individuals to control occupational health hazards and to prevent related trauma and disease.

Mention of company names or products does not constitute endorsement by the National Institute for Occupational Safety and Health.

HETA 83-114-1304  
MAY 1983  
PLAN DE SALUD DEL VALLE, INC.  
FORT LUPTON, COLORADO

NIOSH INVESTIGATOR:  
Bobby J. Gunter, Ph.D., IH

## I. SUMMARY

In January 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from Plan de Salud del Valle, Inc., Fort Lupton, Colorado, to evaluate organic solvent exposures in the printing room at this facility.

On February 2, 1983, a NIOSH investigator conducted an environmental evaluation. One environmental breathing zone and three general room air samples were collected for the four hours the printing machines were in operation. These samples were analyzed for xylene, toluene, and petroleum naphtha. All air samples for toluene and xylene were below the laboratory limit of detection of 0.01 milligrams per sample (mg/sample). The values found for petroleum naphtha were 71, 53, 103, and 73 mg/M<sup>3</sup>. The average concentration was 75 mg/M<sup>3</sup>. There is no evaluation criterion for petroleum naphtha. The values found at the time of this evaluation would produce a significant odor and cause irritation of the eyes and upper respiratory system. There was only one worker in this area during this evaluation, who reported no medical problems which could be attributed to work exposure.

The printing room is located adjacent to the boiler room with a door connecting the two areas. Since there is no ventilation in the printing room, it would be very easy for the volatile organic vapors to pass from this room to the boiler room with the possibility of fire and destruction of the entire facility.

On the basis of the environmental evaluation, NIOSH concluded that a potential health hazard existed from exposures to petroleum naphtha. There is a fire hazard due to the close proximity of the printing room to the boiler room. Recommendations that may assist in preventing a health hazard at this work site are included in this report.

KEYWORDS: SIC 8081 (Outpatient Care Facilities), petroleum naphtha, toluene, xylene.

## II. INTRODUCTION

In January 1983, the National Institute for Occupational Safety and Health (NIOSH) received a request from Plan de Salud del Valle, Inc., Fort Lupton, Colorado, to evaluate organic solvent exposures in the printing room at this facility. The worker running the printing room was interested in finding out if the strong odors generated by the organic solvents used in the printing could cause a medical problem.

On February 2, 1983, a NIOSH investigator conducted an environmental evaluation. Results of the environmental sampling were given by telephone to the director of the facility in March 1983.

## III. BACKGROUND

The Plan de Salud del Valle, Inc. is an outpatient clinic serving the Fort Lupton, Colorado, area. The area evaluated was a small printing room used from one to four hours per day, five days per week. The printing inks and cleaning solvents contained petroleum naphtha, xylene, and toluene.

The printing room was evaluated for solvent exposures due to the strong odor generated during printing.

## IV. ENVIRONMENTAL DESIGN AND METHODS

One breathing zone and three general room air samples were collected for petroleum naphtha, toluene, and xylene. These samples were collected on organic vapor charcoal sampling tubes and analyzed by NIOSH Method P&CAM No. 127.

There was only one worker operating the printing machines. This worker was interviewed with questions directed at symptoms that would arise from overexposure to the type of solvents used in the printing operation.

## V. EVALUATION CRITERIA

### A. Environmental

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As a guide to the evaluation of the hazards posed by workplace exposures, NIOSH field staff employ environmental evaluation criteria for assessment of a number of chemical and physical agents. These criteria are intended to suggest levels of exposure to which most workers may be exposed up to 10 hours per day, 40 hours per week for a working lifetime without experiencing adverse health effects. It is, however, important to note that not all workers will be protected from adverse health effects if their exposures are maintained below these levels. A small percentage may experience adverse health effects because of individual susceptibility, a pre-existing medical condition, and/or a hypersensitivity (allergy).

In addition, some hazardous substances may act in combination with other workplace exposures, the general environment, or with medications or personal habits of the worker to produce health effects even if the occupational exposures are controlled at the level set by the evaluation criterion. These combined effects are often not considered in the evaluation criteria. Also, some substances are absorbed by direct contact with the skin and mucous membranes, and thus potentially increase the overall exposure. Finally, evaluation criteria may change over the years as new information on the toxic effects of an agent become available.

The primary sources of environmental evaluation criteria for the workplace are: (1) NIOSH Criteria Documents and recommendations, (2) the American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values (TLV's), and (3) the U.S. Department of Labor (OSHA) occupational health standards. Often, the NIOSH recommendations and ACGIH TLV's are lower than the corresponding OSHA standards. Both NIOSH recommendations and ACGIH TLV's usually are based on more recent information than are the OSHA standards. The OSHA standards also may be required to take into account the feasibility of controlling exposures in various industries where the agents are used; the NIOSH-recommended standards, by contrast, are based solely on concerns relating to the prevention of occupational disease. In evaluating the exposure levels and the recommendations for reducing these levels found in this report, it should be noted that industry is legally required to meet only those levels specified by an OSHA standard.

A time-weighted average (TWA) exposure refers to the average airborne concentration of a substance during a normal 8- to 10-hour workday. Some substances have recommended short-term exposure limits or ceiling values which are intended to supplement the TWA where there are recognized toxic effects from high short-term exposures.

Environmental criteria for substances evaluated in this investigation are shown below.

	Permissible Exposure Limits 8-Hour Time-Weighted Exposure Basis
Petroleum naphtha.....	*
Toluene.....	375 mg/M <sup>3</sup> (NIOSH, ACGIH) 750 mg/M <sup>3</sup> (OSHA)
Xylene.....	435 mg/M <sup>3</sup> (NIOSH, ACGIH, OSHA)

\* = no evaluation criterion established.

mg/M<sup>3</sup> = milligrams of substance per cubic meter of air.

B. Toxicological

Aliphatic Hydrocarbons<sup>1,2</sup> -- Petroleum naphtha is a mixture of aliphatic hydrocarbons in the 5 to 8 carbon range. Aliphatic hydrocarbons are derived from petroleum by the cracking, distillation, and fractionation of crude oil. They are compounds composed of carbon chains with attached hydrogen atoms. The chains may be branched and some adjacent carbons may not have a full quota of hydrogen atoms (called unsaturation). As a rule, the longer the carbon chain, the less volatile the compound. Branching and unsaturation increase the volatility of the compound. As usually found in the workplace, the usual fractions of aliphatic hydrocarbons are mixtures of different length carbon chains with different degrees of branching but all having a similar boiling point within a fairly narrow range.

Methane (1 carbon) and ethane (2 carbons, saturated) are both gases whose only danger to health, other than the danger of explosion, is asphyxiation if too much oxygen is displaced. Other short-chained gaseous hydrocarbons are central nervous system (CNS) depressants, as well as possible asphyxiants. As a general rule, up to a chain length of 7 carbons (heptane), the fewer carbons, the less toxic, but more rapid the depressant effect. With more than 7 carbons the toxic effects progressively decrease and the time frame continues to increase. Toxic effects are primarily CNS depression and irritation of the respiratory tract. Low level CNS depression may be felt as a headache. The liquid hydrocarbons may irritate the skin and can cause dermatitis by defatting the skin on repeated and/or prolonged exposure. All of the liquid hydrocarbons are extremely irritating to the lungs if aspirated; so if swallowed, a person should not be made to vomit. n-Hexane (6 carbons, unbranched) can cause a peripheral neuritis on repeated exposure.

Gasoline is a mixture of hydrocarbons (with or without anti-knock or other additives) primarily in the 5 to 10 carbon range, mostly aliphatic, but often containing some aromatics (benzene, toluene, xylene). Liquified petroleum gas (LPG) is a mixture of propane (3 carbons) and butane (4 carbons).

Toluene<sup>3</sup> -- Toluene is a clear, colorless, non-corrosive liquid with a sweet, pungent, benzene-like odor. Approximately 70% of all toluene that is produced is converted into benzene. Extreme caution when using toluene should be taken since it is often contaminated with benzene. It is dangerously absorbed both by inhalation and skin absorption. Toluene is an irritant and a central nervous system depressant. Some of the common symptoms include defatting dermatitis, bronchitis, pneumonitis, nausea, vomiting, headaches, dizziness, irritability, and inebriation.

Xylene<sup>4</sup> -- Xylene overexposures may cause headaches, nausea, gastrointestinal disturbance, and dizziness. Eye, nose, throat, and skin irritation are also common complaints when workers are exposed to xylene. Workers exposed to xylene should have laboratory test for complete blood count, a routine urinalysis, and liver function test.

#### VI. ENVIRONMENTAL RESULTS

On February 2, 1983, a NIOSH investigator conducted an environmental evaluation. One breathing zone and three general room air samples were collected for the four hours the printing machines were in operation; these samples were analyzed for toluene, xylene, and petroleum naphtha. All air samples for toluene and xylene were below the laboratory limit of detection of 0.01 milligrams per sample (mg/sample). The values for petroleum naphtha were 71, 53, 103, and 73 mg/M<sup>3</sup>. The average concentration was 75 mg/M<sup>3</sup>. (Refer to Table 1.) There is no evaluation criterion for petroleum naphtha. The values found at the time of this evaluation would produce a significant odor and cause irritation of the eyes and upper respiratory system. There was only one worker in this area during this evaluation and she was interviewed and apparently had no medical problems which she could attribute to her work exposure.

Xylene and toluene did not pose a health hazard. The petroleum naphtha exposures do pose a potential health hazard since there was no ventilation in this room and vapor concentrations may build up when the room is used for longer periods of time. The petroleum naphtha vapors also pose a fire hazard due to the close proximity of these vapors to the adjacent room where the boilers are located. The printing room is located adjacent to the boiler room with a door connecting the two areas. Since there is no ventilation in the printing room, it would be very easy for the volatile organic vapors to pass from this room to the boiler room with the possibility of fire and destruction of the entire facility.

#### VII. DISCUSSION AND CONCLUSIONS

Evaluation results do indicate exposures to petroleum naphtha. Even if this area was ventilated it would still be a safety hazard due to the close proximity of the organic vapors (petroleum naphtha) to the boilers. The printing operation should be moved to a properly ventilated area where it would not pose either a health or fire hazard, such as the basement.

#### VIII. RECOMMENDATIONS

1. The printing operation should be moved away from the boiler room.
2. Local exhaust ventilation should be installed in the newly designated printing room that would eliminate worker exposure to organic solvents. A small canopy hood would be sufficient.

#### IX. REFERENCES

1. International Labour Office, Encyclopaedia of Occupational Health and Safety. McGraw-Hill Book Company, New York (1971), pp. 686-689, 1027-1031.
2. Dean, J.A., ed., Lang's Handbook of Chemistry, 12th Edition. McGraw-Hill Book Company, New York (1979), Table 7-4, Physical Constants of Organic Compounds.
3. Criteria for a Recommended Standard...Occupational Exposure to Toluene, HEW Publication No. (NIOSH) 73-11023, Cincinnati, Ohio, 1973.
4. Criteria for a Recommended Standard...Occupational Exposure to Xylene, HEW Publication No. (NIOSH) 75-168, Cincinnati, Ohio, 1976.

#### X. AUTHORSHIP AND ACKNOWLEDGMENTS

Report Prepared By: Bobby J. Gunter, Ph.D.  
Regional Industrial Hygienist  
NIOSH, Region VIII  
Denver, Colorado

Originating Office: Hazard Evaluation and Technical  
Assistance Branch (HETAB)  
Division of Surveillance, Hazard  
Evaluations, and Field Studies (DSHEFS)  
NIOSH, Cincinnati, Ohio

Report Typed By: Marilyn K. Schulenberg  
Occupational Health Technician  
NIOSH, Region VIII  
Denver, Colorado

#### XI. DISTRIBUTION AND AVAILABILITY

Copies of this report are currently available upon request from NIOSH, Division of Standards Development and Technology Transfer, Information Resources and Dissemination Section, 4676 Columbia Parkway, Cincinnati, Ohio 45226. After 90 days the report will be available through the National Technical Information Service (NTIS), Springfield, Virginia. Information regarding its availability through NTIS can be obtained from NIOSH, Publications Office, at the Cincinnati address.

Copies of this report have been sent to:

1. Plan de Salud del Valle, Inc.
2. U.S. Department of Labor/OSHA - Region VIII.
3. NIOSH - Region VIII.
4. Colorado Department of Health.
5. State Designated Agency.

For the purpose of informing affected employees, a copy of this report shall be posted in a prominent place accessible to the employees for a period of 30 calendar days.

TABLE 1  
Breathing Zone (BZ) and General Room Air Concentrations of  
Xylene, Toluene, and Petroleum Naphtha

Plan de Salud del Valle, Inc.  
Fort Lupton, Colorado

February 2, 1983

Sample Number	Location	Sampling Time	mg/M <sup>3</sup>		Petroleum Naphtha
			Xylene	Toluene	
1	Duplicator Area (BZ)	8:12 AM - 12:00 N	*	*	71
2	Duplicator Room	8:15 AM - 12:00 N	*	*	53
3	Duplicator Room	8:16 AM - 12:00 N	*	*	103
4	Duplicator Room	8:20 AM - 11:30 AM	*	*	73
EVALUATION CRITERIA			435	750	**
LABORATORY LIMIT OF DETECTION mg/sample			0.01	0.01	0.1

\* below laboratory limit of detection

\*\* no evaluation criterion established for petroleum naphtha